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(54) **PNEUMATIC TIRE**

LUFTREIFEN

BANDAGE PNEUMATIQUE

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention concerns a pneumatic tire provided with a punctureless function, and more particularly a pneumatic tire composed to prevent puncture during running without involving a large increase in weight or degradation of comfortable ride.

Detailed Description of the Related Art

[0002] The pneumatic tire may get punctured by a nail or the like during the running. There, punctureless structures such as dispose of sealant on the inner surface of the tire or embedment of steel pieces in the manner of fish scales in the tread portion for reinforcement of the inner liner have been proposed in order to prevent punctures due to a stuck nail or others during the running.

[0003] Tires having such puncture preventing means are known from e.g. GB-A-2 240 953 or JP-A-60- 154 904.

[0004] However, in case of arranging sealant on the inner surface of the tire (see e.g. EP-A- 0 302 400), the weight increases remarkably to obtain a sufficient puncture prevention function and moreover, if sealant is arranged in an area corresponding to the side portion of the inner surface of the tire, there was a problem that sealant flows to the tread side by a centrifugal force during the tire rotation. In addition, in case of embedding scales like steel pieces in the tread portion, there was a problem of large increase in weight and, at the same time, deterioration of the comfortable ride.

SUMMARY OF THE INVENTION

[0005] The present invention has an object to provide a pneumatic tire which makes it possible to effectively prevent puncture during running without involving a large increase in weight or degradation of comfortable ride. According to the invention the pneumatic tire in order to achieve the aforementioned object is characterized by disposing a plurality of films in the manner of fish scales at least in a region corresponding to a tread portion of an inner surface of the tire, partially fixing each of the films on the inner surface of the tire, and covering the fixed portions of the films with the non-fixed portions of the other films.

[0006] Particular embodiments of the invention are the subject of the dependent claims.

[0007] In case of disposing a plurality of films in the manner of fish scales on the inner surface of the tire, when a nail or the like is stuck, the film of that position deforms in a way to escape from the nail or the like. If the nail or the like is drawn out, the film that has been deformed restitutes the original shape by its own elas-

ticity and the inner pressure of the tire and turns up to obstruct the hole. Thus, it is possible to effectively prevent the puncture during running. In addition, as the film can be made of a light material such as nonmetallic materials presenting flexibility, a large increase in weight or degradation of comfortable ride is involved hardly.

[0008] In the present invention, the film is preferably 0.02 mm or more in thickness and 4.0 cm² or less in area. The films can be made to function satisfactorily as a valve, by setting the dimensions of the films to the aforementioned range.

BRIEF DESCRIPTION OF DRAWINGS

[0009]

Fig. 1 is a half cross-section view of a pneumatic tire according to an embodiment of the present invention;

Fig. 2 is a plan view showing films in the manner of fish scales disposed on the inner surface of the pneumatic tire according to an embodiment of the present invention;

Fig. 3 is a cross-section along X-X of Fig. 2;

Fig. 4 is an enlarged cross-section view showing the state of the films when a nail is stuck; and

Fig. 5 is an enlarged cross-section view showing the state of the films after the nail is drawn out.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0010] Now, a composition of the present invention shall be described in detail referring to the attached drawings.

[0011] Fig. 1 shows a pneumatic tire according to an embodiment of the present invention, 1 is a tread portion, 2 is a side wall portion and 3 is a bead portion. A carcass layer 4 is mounted between a pair of right and left bead portions 3, 3 and an end thereof in the tire width direction is wound up from the tire inside to the outside around a bead core 5. An inner liner layer 6 is disposed inside the carcass layer 4. Moreover, a plurality of belt layers 7 are embedded in the outer peripheral side of the carcass layer 4 in the tread portion 1.

[0012] In the aforementioned pneumatic tire, a plurality of films 8 cut substantially square are arranged in the manner of fish scales in a region corresponding to the tread portion 1 of the inner surface of the tire. As shown in Fig. 2 and Fig. 3, respective film 8 is fixed to the inner surface of the tire along one side, this portion forms a fixed portion 8a and the other portion forms a non-fixed portion 8b. What is more, the fixed portion 8a of the film 8 is covered by the non-fixed portion 8b of the other film 8. Obviously, the non-fixed portion 8b of the film 8 and the non-fixed portion 8b of the other film 8 may be disposed to overlap partially. Moreover, the film 8 may be fixed only by a single corner. An adhesive can be used

for forming such fixed portion 8a.

[0013] The material of the film 8 is not particularly limited provided that it can retain air satisfactorily and is flexible. For instance, nonmetallic materials having the flexibility, including resins such as nylon, polyethylene terephthalate (PET) or the like, rubbers such as natural rubber, butyl rubber or the like, and a thermoplastic elastomer obtained by dissipating vulcanized rubber in a thermoplastic resin, can be used.

[0014] The thickness of the film 8 can be set to 0.02mm or more and preferably in a range from 0.02mm to 1.0mm. If the thickness of the film 8 is less than 0.02mm, it is feared that the film 8 be penetrated when a nail or the like is stuck. On the contrary, if the thickness of the film 8 exceeds 1.0mm, the film 8 deforms hardly when a nail or the like is stuck.

[0015] Area of the film 8 can be set less than 4.0 cm² and, more preferably, in a range from 1.0 cm² to 4.0 cm². If the area of the film 8 is less than 1 cm², the number of films 8 turns up to increase excessively. On the contrary, if the area of the film 8 exceeds 4.0 cm², it is feared that the film 8 be penetrated when a nail or the like is stuck. Though the shape of the film 8 is not particularly limited, it is advantageously quadrilateral such as square or the like in order to cover the inner surface of the tire effectively.

[0016] Next, a case where a nail is stuck during the running of the aforementioned tire shall be explained. First, as shown in Fig. 4, if a nail N stuck in the tread portion penetrates a belt layer 7 and projects on the inner surface of the tire, a non-fixed portion 8b of the film 8 situated in that position deforms in a way to escape from the nail N. Next, as shown in Fig. 5, if the nail N is drawn out, the non-fixed portion 8b of the film 8 that has been deformed is thrust by its own elasticity and a tire inner pressure P, returns to its original shape and ends up by obstructing a nail hole H.

[0017] Moreover, as the fixed portion 8a of the film 8 is covered by the non-fixed portion 8b of the other film 8, even when a nail stuck in the tread portion penetrates the fixed portion 8a of the film 8, it is possible to obstruct the nail hole similarly as mentioned above.

[0018] According to the embodiment mentioned above, as films 8 in the manner of fish scales are disposed in a region corresponding at least to the tread portion 1 of the inner surface of the tire, it is possible to prevent effectively puncture during running. What is more, the film 8 being made of a soft nonmetallic material, a large increase in weight or degradation of comfortable ride as in the conventional punctureless structures is not involved.

[0019] Though a case where films 8 in the manner of fish scales are disposed in the region corresponding to the tread portion of the inner surface of the tire has been described for the aforementioned embodiment, films in the manner of fish scales can be disposed also in a region corresponding to the side wall portion of the inner surface of the tire. In case where the films in the manner

of fish scales are disposed in the region corresponding to the side wall portion of the inner surface of the tire, it becomes possible to prevent effectively puncture when a nail or the like is stuck in the side wall portion. What is more, the films in the manner of fish scales fixed to the inner surface of the tire would not move to the tread side even if they are subjected to the centrifugal force during the tire rotation.

[0020] Though preferred embodiments of the present invention have been described hereinabove, it should be understood that various modifications, replacements or substitutions can be made to them, without departing from the scope of the present invention as defined by the attached claims.

[0021] As mentioned hereinabove, according to the present invention, a plurality of films are disposed in the manner of fish scales in at least a region corresponding to the tread portion of the inner surface of the tire, a part of respective films being fixed on the inner surface of the tire, the fixed portions of the films being covered by the non-fixed portions, it is possible to effectively prevent puncture during running without involving a large increase in weight or degradation of comfortable ride. Consequently, a pneumatic tire assuring light weight and comfortable ride and, at the same time, an excellent punctureless function can be provided.

Claims

1. A pneumatic tire comprising a plurality of films (8) disposed in the manner of fish scales in at least a region corresponding to a tread portion (1) of an inner surface of the tire, each of the films (8) being partially fixed on the inner surface of the tire, the fixed portions (8a) of the films (8) being covered by the non-fixed portions (8b) of the other films (8).
2. The pneumatic tire of claim 1, wherein said film is 0.02 mm or more in thickness and 4.0 cm² or less in area.
3. The pneumatic tire of claim 1 or 2, wherein said film is made of nonmetallic material presenting flexibility.

Patentansprüche

1. Luftreifen umfassend eine Vielzahl von Filmen (8), die wie Fischschuppen in mindestens einem einem Laufflächenabschnitt (1) einer Innenfläche des Reifens entsprechenden Bereich angeordnet sind, wobei jeder der Filme (8) teilweise an der Innenfläche des Reifens befestigt ist und die befestigten Abschnitte (8a) der Filme (8) von den nichtbefestigten Abschnitten (8b) der anderen Filme (8) überdeckt werden.

2. Luftreifen nach Anspruch 1, wobei der Film eine Dicke von 0,02 mm oder mehr und eine Fläche von 4,0 cm² oder weniger aufweist.
3. Luftreifen nach Anspruch 1 oder 2, wobei der Film aus einem nichtmetallischen Material hergestellt ist, das Flexibilität aufweist.

Revendications

1. Bandage pneumatique comprenant plusieurs films (8) disposés à la manière d'écailles de poisson dans au moins une région correspondant à une portion de bande de roulement (1) d'une surface interne du bandage, chacun des films (8) étant fixé partiellement sur la surface interne du bandage, les portions fixées (8a) des films (8) étant couvertes par les portions non fixées (8b) des autres films (8).
2. Bandage pneumatique selon la revendication 1, où ledit film a une épaisseur de 0,02mm ou plus et une surface de 4,0cm² ou moins.
3. Bandage pneumatique selon la revendication 1 ou 2, où ledit film est réalisé en un matériau non métallique ayant une flexibilité.

Fig.1

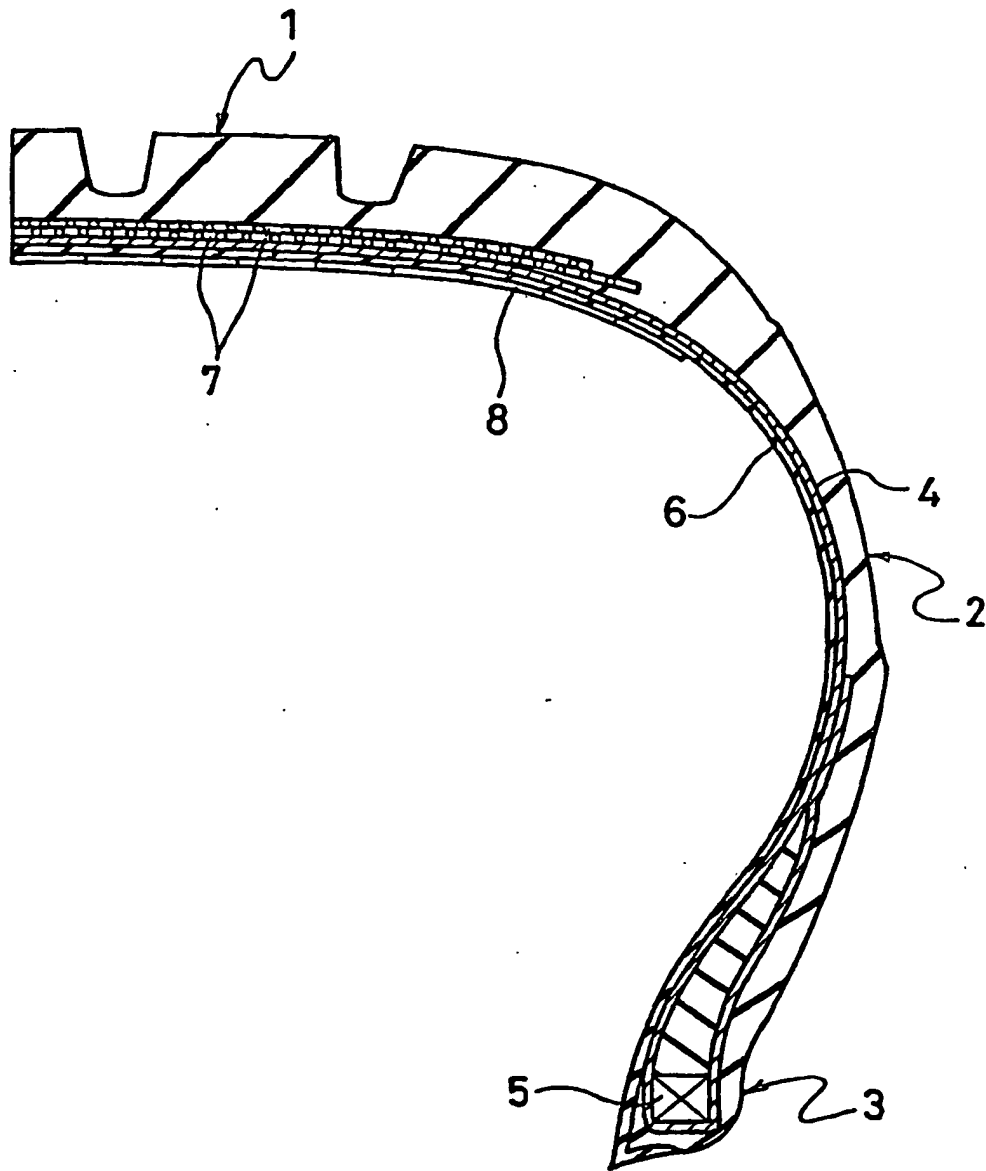


Fig.2

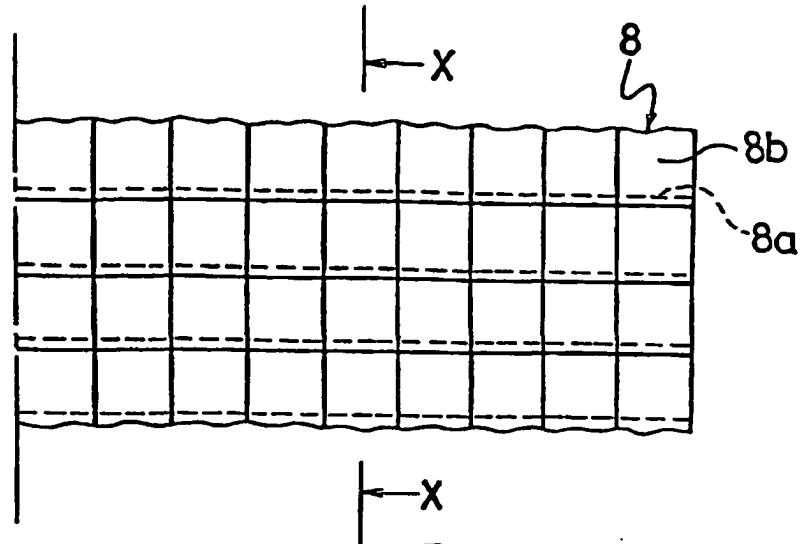


Fig.3

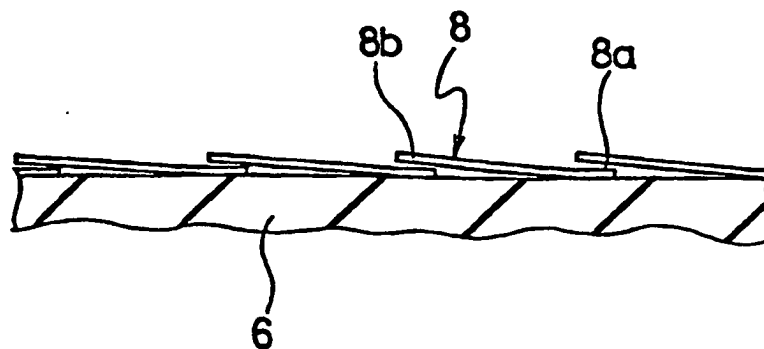


Fig.4

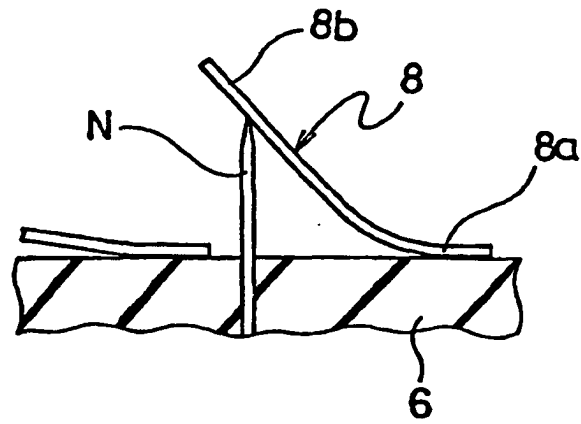


Fig.5

